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the carnivorous brain with which it has been compared are merely mentioned and the author passes on to propose the question whether there can not be an occipital lobe without a parieto-occipital fissure and decides that there can be if the caudal prolongation of the lateral horn, the post. cornu, is taken as the criterion. Again he argues for the recognition of both frontal and parietal lobes even where the fissure of Rolando is absent. It is plain from what has been said that the convolutions can have very little value in determining phylogenetic relationship and that their significance is not fundamental. The remaining pages are devoted to the various theories of the formation of the convolutions. This is the least satisfactory portion of the paper. It should be added that there are more than forty cuts interpolated in the text, many of them representing the brains of unusual or rare animals.

II.—ASSOCIATION, REACTION.

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HÖFFDING, *Ueber Wiedererkennen, Association und psychische Aktivität.*, Viertelj. f. wissenschaft. Philos. 1889 XIII 420; 1890 XIV 27, 167, 293.

LEHMANN, *Kritische und experimentelle Studien über das Wiedererkennen*, Phil. Stud. 1891 VII 169.

WUNDT, *Bemerkungen zur Associationslehre*, Phil. Stud. 1891 VII 329.

JASTROW, *A statistical study of memory and association*, Educational Review, 1891 II 442.

RIBOT, *Enquête sur les idées générales*, Rev. Philos. 1891 XXXII 376.

MUENSTERBERG, *Zur Individualpsychologie*, Centralbl. f. Nervyheilkunde, 1891 XIV 196.

DUMAS, *L'Association des idées dans les passions*, Rev. Philos. 1891 XXXI 483.

The papers by Prof. Höffding, Dr. Lehmann and Prof. Wundt are intimately related to each other, as well as to preceding articles and text-books. Höffding criticises Lehmann's previous paper "Ueber Wiedererkennen" (Phil. Stud. 1888, V 96-156), in which the latter maintained that it is not necessary to assume similarity as a principle of association. Höffding argues for the integrity of association by similarity, laying special stress on the recognition of previous experiences. In such cases the recognition is the psychological correlate of the greater mobility of the corresponding molecules of the brain. A change which has once taken place occurs the more readily the second time. Lehmann argues that every experience is complex, and that the recognition, even of a comparatively simple sensation, is due to contiguity rather than similarity. Wundt in view of these papers and of Scripture's recent experimental study explains and elaborates the doctrine of association contained in the third edition of his psychology. He holds that simultaneous association should be ranked co-ordinate with successive association, and that the latter depends, as the name itself indicates, on the continuous interweaving of all the ideas under the control of consciousness. We may look on the disagreement of our leading psychologists in these questions without great anxiety, for after all the matter is largely one of nomenclature.

Turning to the experimental results of Lehmann's paper, we find them to be of interest. In his first section he gives the results of 428 trials on

the recognition of smells. In 45% of the trials an immediate association was called up, in $\frac{1}{4}$ of which the observer was apparently mistaken as to the nature of the smell. In 28% of the trials a name was immediately suggested, which was wrong $\frac{1}{2}$ of the time. In 7% of the trials the smell was recognized, but called up no association nor name, and this class Lehmann considers the most interesting theoretically. The second section is on the recognition of sounds. Lehmann finds, as Starke and Merkel had previously found, that the intensity of the second of two sounds is overestimated. Lehmann thinks that this is because the actual sensation must appear stronger than a memory-image. On this assumption the longer the interval between the two sounds, and the less exact the memory-image of the first sound, the greater should be the overestimation of the second sound. The experiments given in support of this theory do not seem to confirm it very well, but Lehmann thinks the variations are due to a periodicity in the fading of the memory-image. It is not, however, a matter of course that because a sensation is remembered less exactly, it should be represented as weaker. The complex effects of memory, contrast and fatigue cannot be satisfactorily explained on this theory. The writer of this notice finds that the second of two weights is, indeed, overestimated, but the second of two lights is still more regularly underestimated. It may be suggested that it would be more convenient and accurate if writers who know mathematics (as Lehmann does) would give probable errors and not merely the number of mistakes made in 60 or 1380 trials.

Prof. Jastrow publishes the results obtained with his classes in the University of Wisconsin and on students in the Milwaukee High School. He gave ten words separately to the students, and obtained the first associated words. After 48 hours he required them to write down as many of the original words as they could remember. Then he gave them the original words, and required them to write down as many of their former associations as they could remember. He obtained the interesting result that, while about $\frac{1}{2}$ of the words were forgotten, only $\frac{1}{5}$ of the associations were forgotten. Some of the words were remembered much better than others, whereas the associations on the several words were remembered about equally well. In the classification of the associations the great frequency of certain associations (pen-ink, cat-dog, etc.,) is apparent. There were only 241 different associations in 700 cases. About $\frac{1}{2}$ the associations come under the heading "natural kind, or one object suggesting another of the same class." After this division "whole to part" was the largest. The results obtained with the university students and with the school students were much alike. The women remembered better than the men, and their associations were the less diversified. This illustrates an important distinction, which obtains throughout the animal kingdom—the greater variability of the male.

Prof. Ribot gave words to 103 persons, and recorded the suggested ideas. "Nothing" was suggested 53% of the whole number of times! The observers were classified according to the nature of their mental imagery. The visual type in which a more or less distinct image of the object is called up was the most frequent. The types in which printed words were seen, or auditory images prevailed, were rare. Prof. Ribot formerly called attention to the importance of movement to imagination, but in the present paper nothing is said concerning those whose thoughts are chiefly accompanied by the impulse to spoken words or other movements, to which class Prof. Stricker and the writer of this notice belong.

Dr. Münsterberg has made tests concerning association and various mental traits in school children and others. In the present paper he describes the methods he has used, but does not as yet give his results. The tests suggested by Münsterberg need not be described here until

their appropriateness has been demonstrated by the publication of these. But one cannot fail to honour the heroic perseverance which is borne witness to by experiments of this sort.

The paper by M. Dumas does not contain experimental results.

MARTIUS, *Ueber die Reactionszeit und Perceptionsdauer der Klänge*, Phil. Stud. 1890 VI 394.

MARTIUS, *Ueber den Einfluss der Intensität der Reize auf die Reactionszeit*, Phil. Stud. 1891 VII 469.

Dr. Martius here continues the publication of careful experiments on reaction-time carried out in his private laboratory at Bonn. In his first paper he gives experiments showing that the reaction-time becomes shorter as the pitch of a tone is taken higher. A monochord was used to produce the tones, and the times were measured with the Hipp chronoscope. C^i , c^i , c^{ii} , c^{iii} and c^{iv} were used, and the times compared with those obtained from the noise made by a hammer and anvil. In a general way the times are the same (in the neighborhood of 110σ) for c^{iv} as for the noise, and about 40σ larger for C^i . There are considerable differences with the three observers, which are probably due to the limited number of experiments, 12 to 19 of each sort, with an average variation of about 10σ . Martius concludes from a comparison of the reaction-times that 1 to 4 vibrations are sufficient to call up a sensation.

Prof. Stumpf in reviewing this paper (Zeitsch. f. Psych. II, 230-232) suggested that the difference in time of the reaction might be due to the greater intensity of the higher tone. Martius consequently made experiments in which the intensity was varied, and obtained as result that there is no difference in the length of the reaction-time for sounds of different intensities. This is contrary to the results obtained for several classes of stimuli by Wundt, Exner, v. Kries u. Auerbach, v. Vintschgau u. Honigschmid, v. Wittisch, Berger and the writer of this notice. Martius thinks that this discordance is explained by the greater attention given in his experiments, but it more likely due to the small range of intensity. The intensity of the sounds was not measured, but in no case can a monochord give a very loud sound.

REPSOLD, *Neuer Vorschlag zur Vermeidung des persönlichen Zeit-Fehlers bei Durchgangsbeobachtungen*, Astronomische Nachrichten 1889 Dec. 9, No. 2940.

BECKER, *Ueber einige Versuche von Durchgangsbeobachtungen nach dem neuen Repsold'schen Verfahren*, Astronomische Nachrichten 1891 May 19, No. 3036.

LANDERER, *Sur l'équation personnelle*, Comptes rend. 1889 CVIII 21.

GONNESIAT, *Sur l'équation personnelle dans les observations de passages*, Comptes rend. 1891 CXII 207.

STROOBANT, *Recherches expérimentales sur l'équation personnelle dans les observations de passage*, Comptes rend. 1891 CXIII 457.

ANDRÉ ET GONNESIAT, *Etude expérimentale de l'équation décimale dans les observations de passage*, *fuite à l'Observatoire de Lyon*, Comptes rend. 1892 CXIV 157.

CHRISTIE, *Change of personal equation with stellar magnitudes in transits*, Monthly Notices of the Royal Astron. Soc. 1891 455.

BACKHUYZEN, *Bestimmungen der persönlichen Gleichung bei Passagebeobachtungen*, Viertelj. d. Astron. Gesellsch. 1889 249.

A personal equation machine, The Sidereal Messenger 1891 139.

The photochronograph and its application to the star transits, Georgetown College Observatory 1891 36.

Prof. Wundt and Prof. Exner have called attention to the psychological interest of the personal equation long known to astronomers, and